Continuity of the
Web Enabled Landsat Data (WELD)
Product record in the LDCM era

David Roy

Val Kovalskyy & Indu Kommareddy

Geographic Information Science Center of Excellence,
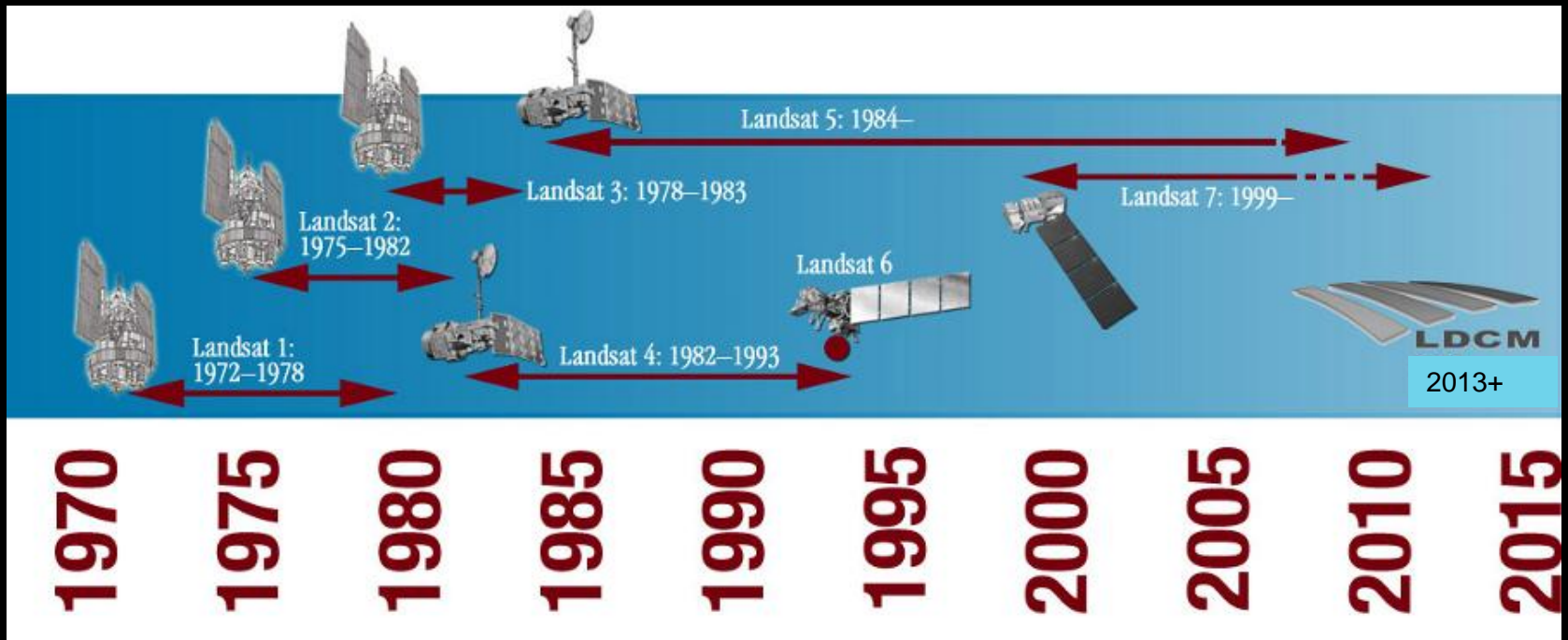
South Dakota State University

Brookings, SD 57007

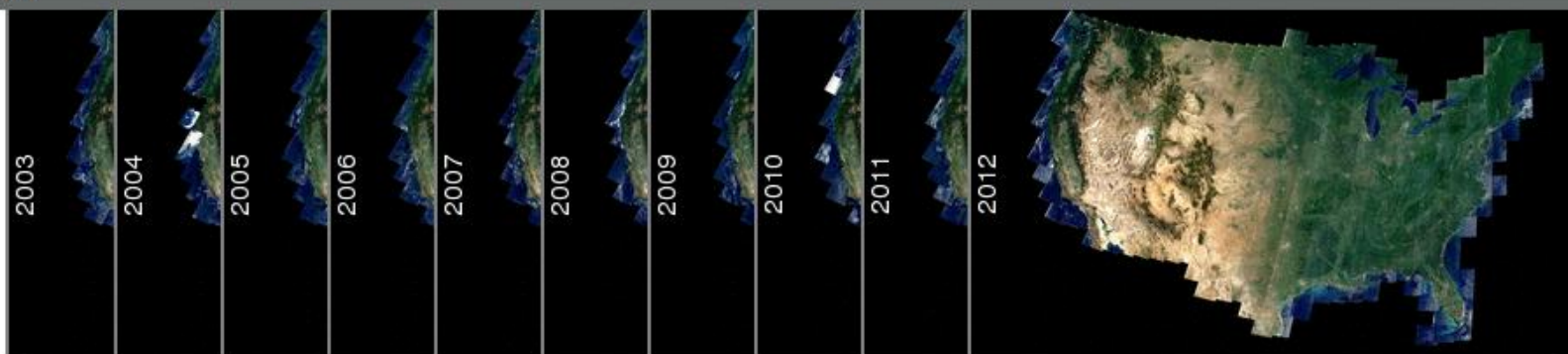# Landsat Satellite Series
The longest Land surface observation record

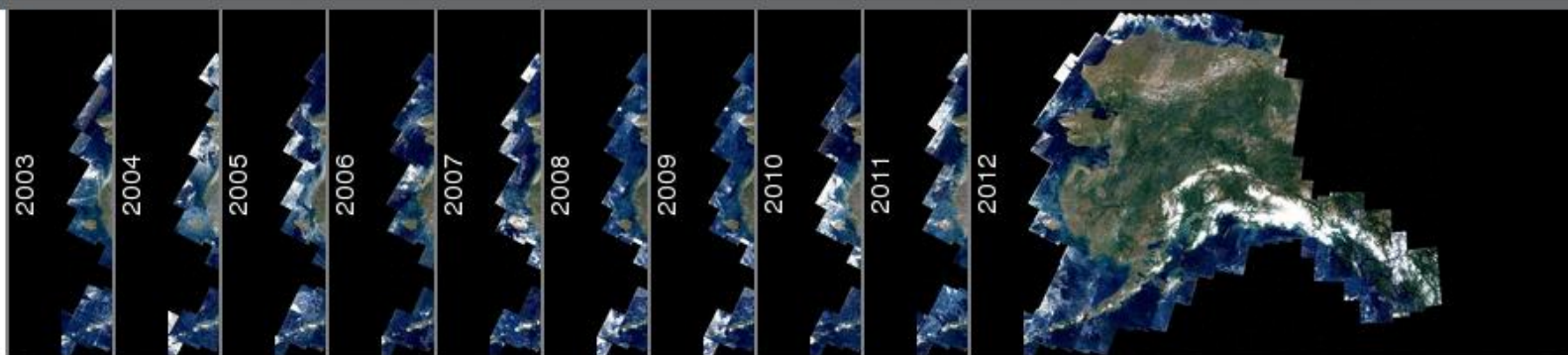WELD process 10 years of CONUS and Alaska 30m Landsat ETM+ data (in MODIS era)

Available Years:

CONUS

Alaska

Interface Help   WELD Product Information   Distribution Metrics

AGU FALL MEETING

San Francisco | 3–7 December 2012

SCIENTIFIC PROGRAM	EVENTS	BOOK MY MEETING

Home | Introduction to the Web-Enabled Landsat Data (WELD) Products Using Open Source Software

◀ Return to Calendar

Introduction to the Web-Enabled Landsat Data (WELD) Products Using Open Source Software

6 Dec 2012 6:00 pm - 10:30 pm

Sponsor:

Non-AGU Event

Ticketing Type:

Open to All

Audience:

Attendee

Location:

San Francisco Marriott Marquis - Sierra A
55 Fourth Street · San Francisco, California 94103

The NASA funded Web-enabled Landsat Data (WELD) project is providing near-continental scale 30m Landsat time series products (http://weld.cr.usgs.gov/). This training workshop will provide student and expert users with tips and techniques to handle the WELD products. Participants will bring their own laptops and a Linux-like Virtual Machine will be installed with remote sensing and GIS open source software, sample WELD products, scripts, and example exercises that illustrate a variety of WELD environmental monitoring and assessment applications. Participants will be assisted through the example exercises and all training material will be available for their later consultation. New WELD product versions will be available and participant feedback and suggestions to evolve the WELD processing algorithms, product contents and format will be sought. More information is available at http://globalmonitoring.sdstate.edu/projects/weld/weldtraining.html
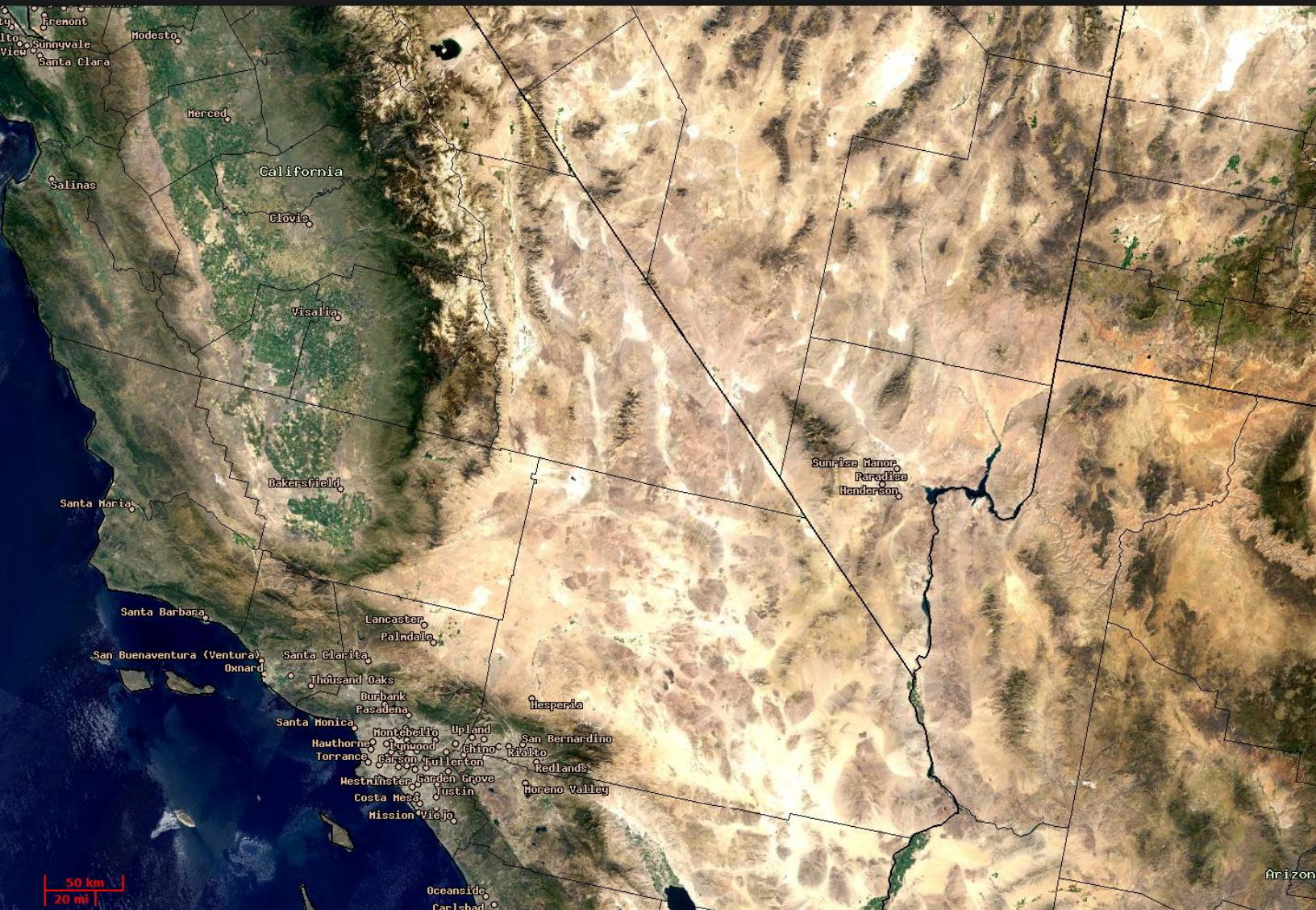
☑ Vector
⊕ Zoom In (or double click)
⊖ Zoom Out (or mouse wheel)
⊙ Next Period
⊙ Previous Period

Order Coordinates

⦿ Longitude/latitude
◯ Albers

Hold the shift button & drag the mouse to define your order area, or enter the area coordinates below

Note: In using Long/Lat the coordinates refer to the SW and NE corners of the area

North: [_____]
South: [_____]
West: [_____]
East: [_____]

[Order Data]

Click the left button to define a single pixel time series dump, or enter the pixel coordinates below

North: [_____]
East: [_____]

[Order Pixel Time Series]

If you want to order many pixel time series (up to 25 pixels per order) and you know their longitude and latitude locations click below

[Bulk Order Pixel Time Series]

Bulk pixel time series dump

You can order a time series dump for one the following product types:

Weekly ○

Monthly ⦿

Seasonal ○

Annual ○

[More data are generated for weekly, than monthly, than seasonal, than annual products, and so will take more time to be made available.]

Enter below a pixel coordinate in each row (up to a maximum of 25 pixel coordinates) in decimal degrees as <u>longitude,latitude</u> for example -113.819587,40.725468
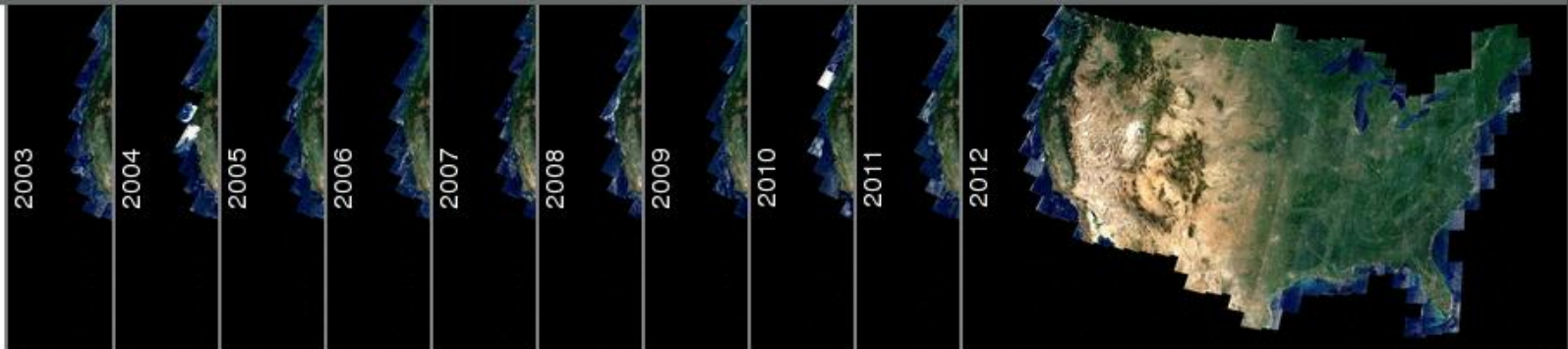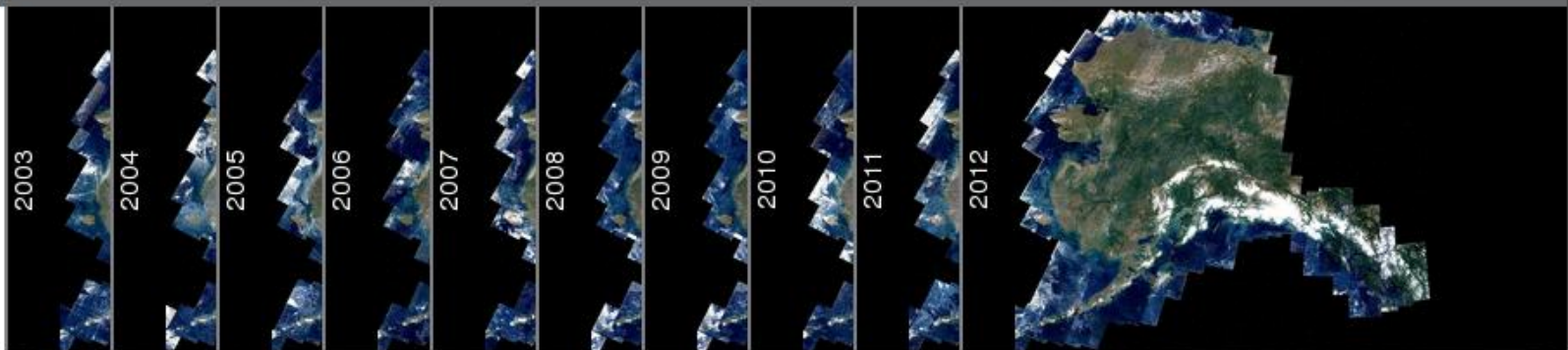
```
1
2
3
4
5
6
```

Place order >>

10 years for CONUS and Alaska (40TB) currently online

>0.5 million files, >70TB, have been distributed to ~1000 users

New NASA Funding
Global Long-Term Multi-Sensor Web-Enabled Landsat Data Record

Principal Investigator:
David Roy
Geographic Information Science Center of Excellence,
South Dakota State University
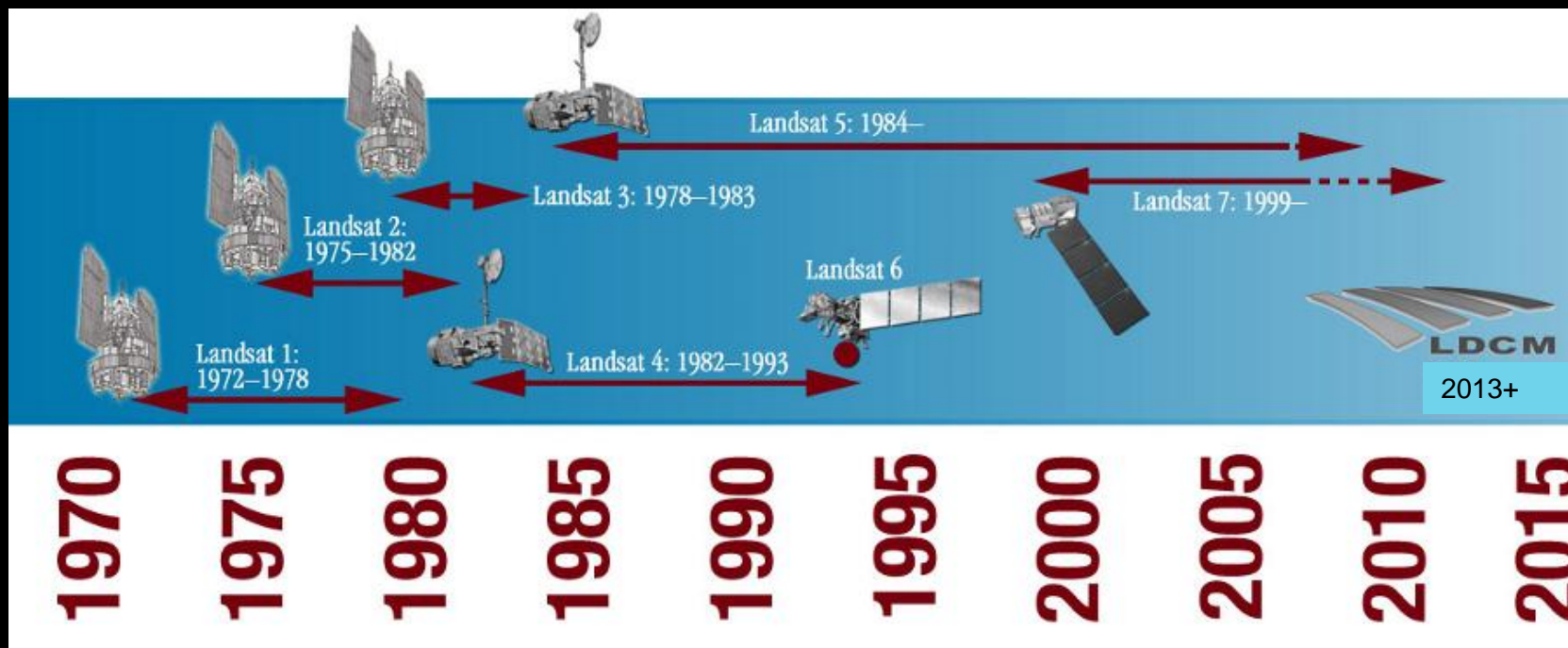Brookings, SD 57007

Co-Investigators:
Rama Nemani
NASA Ames Research Center
Moffett Field, CA 94035

Matthew Hansen
Department of Geography,
University of Maryland, College Park, MD 20742

$4.8 million + Massive USGS Distribution Cost Share
5 years, Spring 2013+

Landsat Satellite Series
The longest Land surface observation record

WELD process 30m Landsat TM & ETM+

Global Archive

Continue WELD Production at SDSU
weekly, monthly, seasonal and annual 30m products, fusion of contemporaneous Landsat 4,5,7 for every year back to 1984
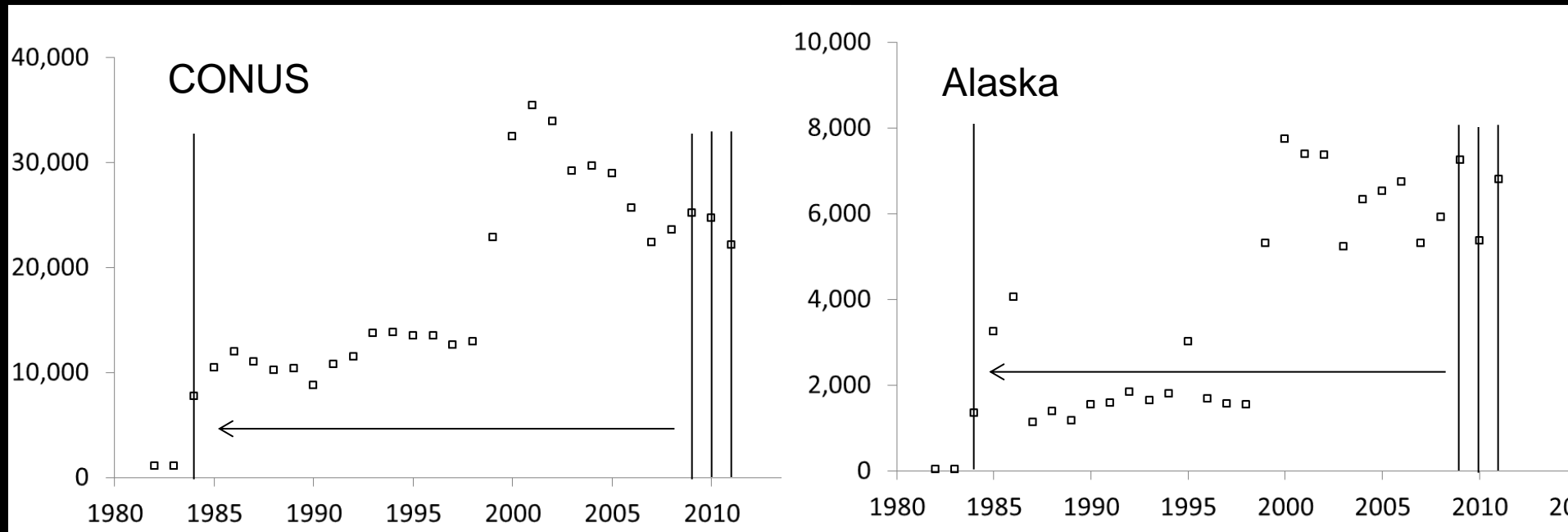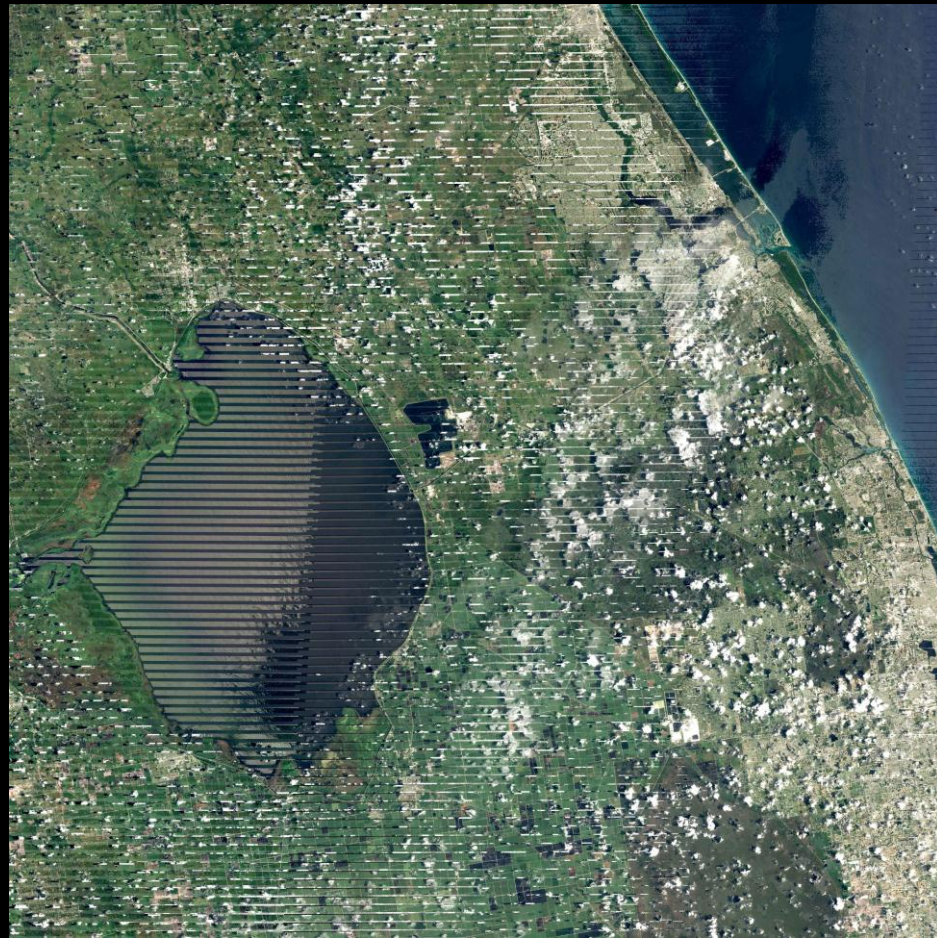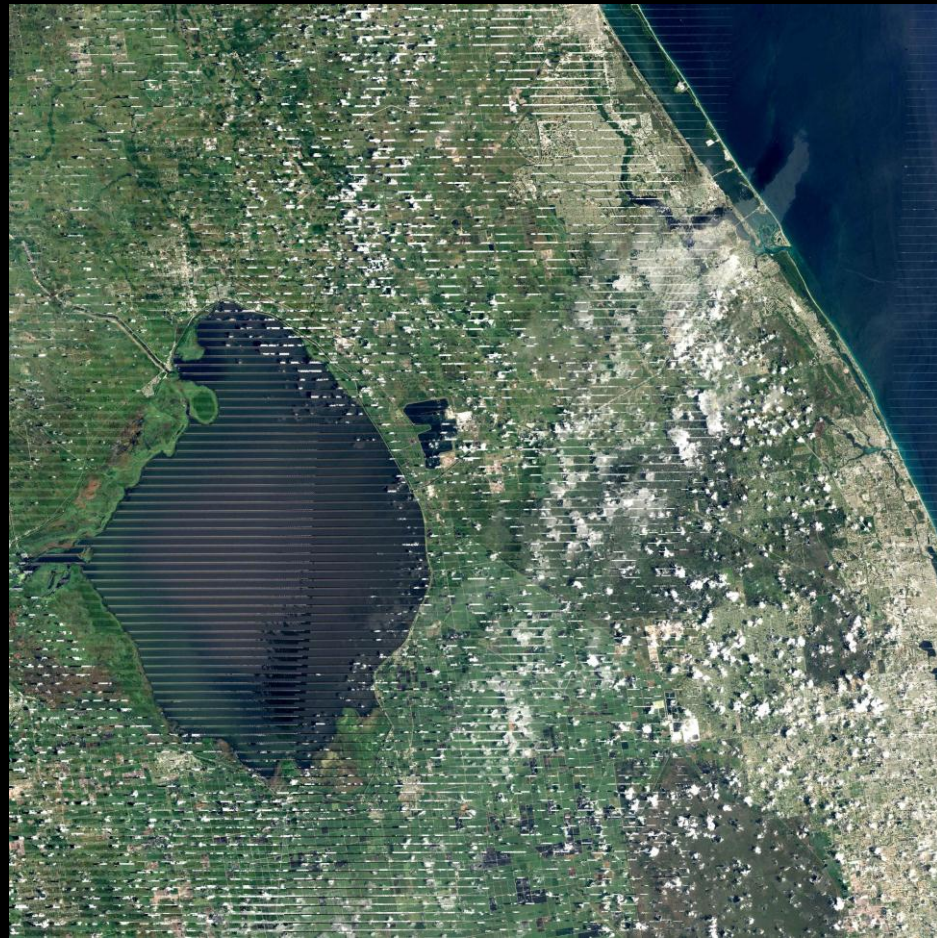
WELD Version 1.5 Compositing
June 2010

Banks Lake WA
Subset of h05v02 WELD tile 3500x3500 30m pixels
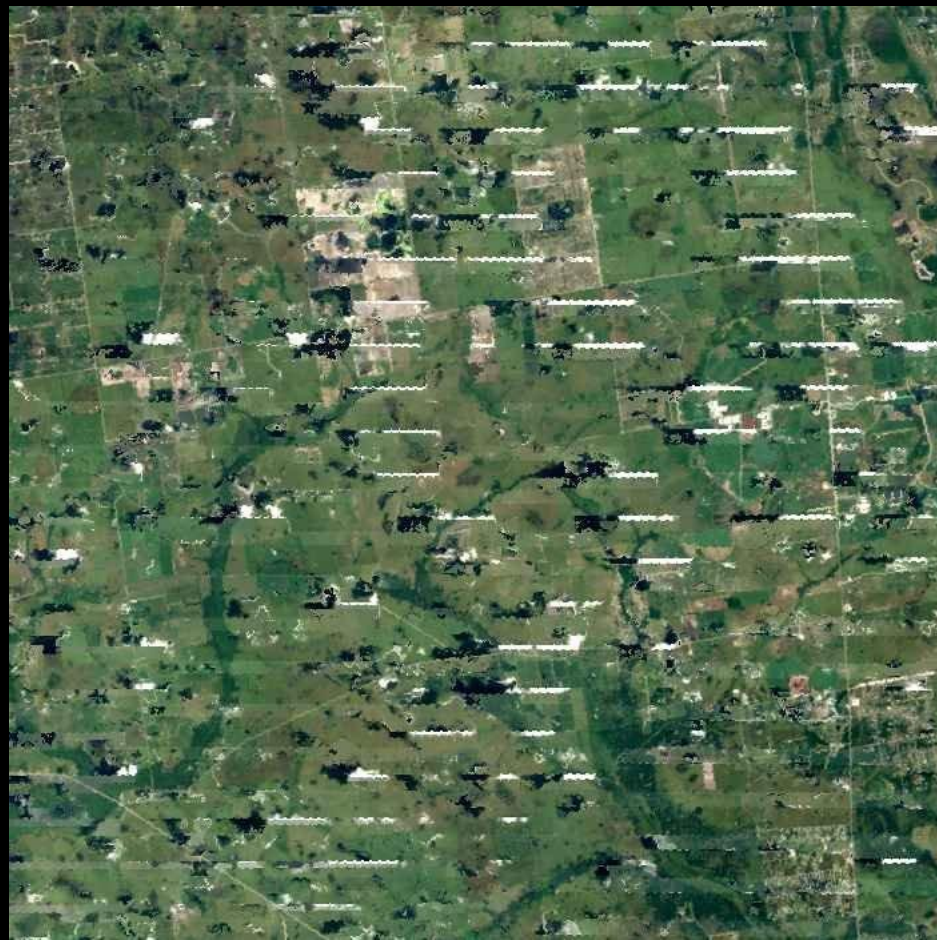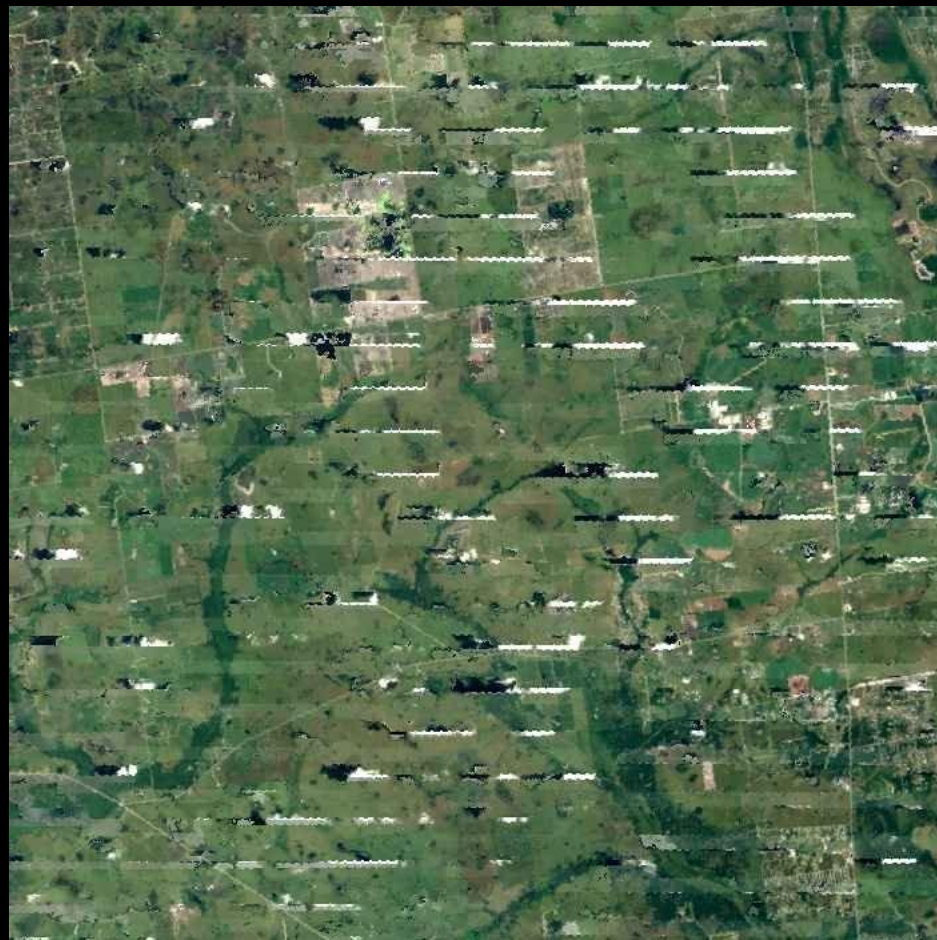
Lake Okeechobee FL
Subset of h27v18 WELD tile 3500x3500 30m pixels

Improved Compositing
June 2010

Banks Lake WA
Subset of h05v02 WELD tile 3500x3500 30m pixels

Lake Okeechobee FL
Subset of h27v18 WELD tile 3500x3500 30m pixels

WELD Version 1.5 Compositing

Banks Lake WA
Subset of h05v02 WELD tile 700x700 30m pixels

Lake Okeechobee FL
Subset of h27v18 WELD tile 700x700 30m pixels

Improved Compositing

Banks Lake WA
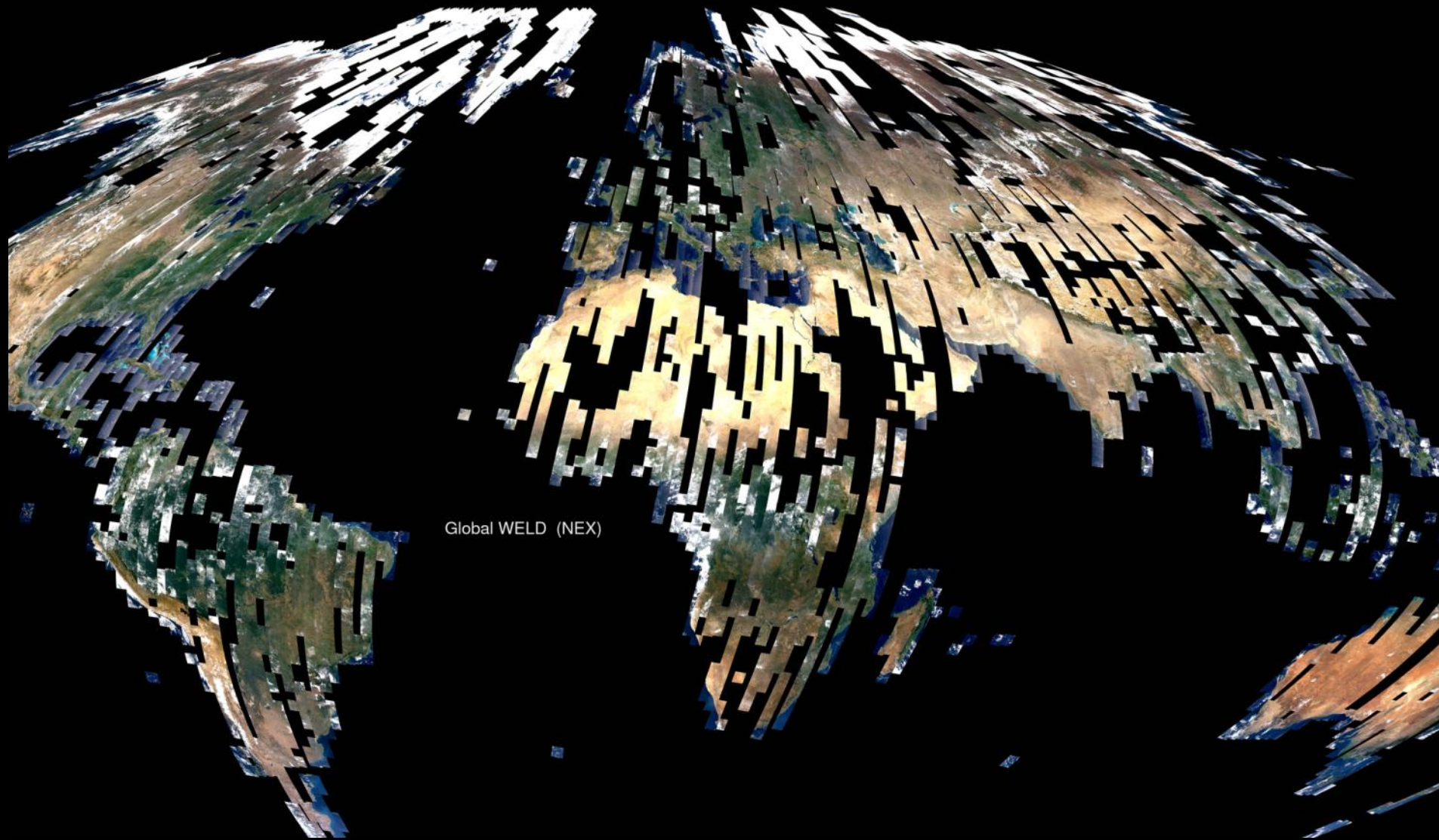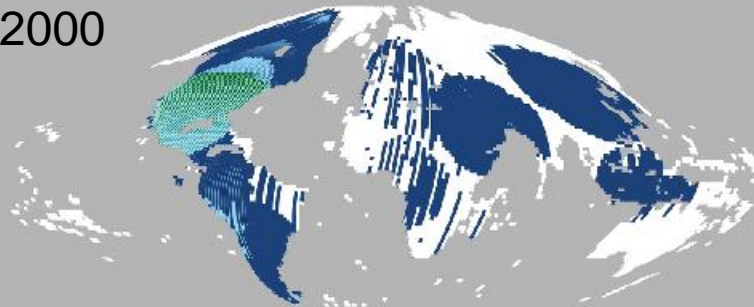Subset of h05v02 WELD tile 700x700 30m pixels

Lake Okeechobee FL
Subset of h27v18 WELD tile 700x700 30m pixels

Global WELD prototype, Landsat 7 ETM+, 7300 May 2010 acquisitions, processed on NASA Earth Exchange (NEX) Supercomputer

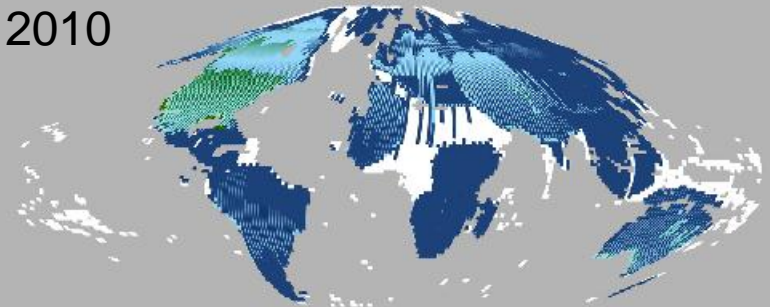Global WELD (NEX)

Total number of Landsat acquisitions for 36 months

0 = White, 1 ≤ Dark Blue ≤ 50, 51 ≤ Light Blue ≤ 100, 101 ≤ Green ≤ 150,
151 ≤ Yellow ≤ 200, 201 ≤ Orange ≤ 250, 251 ≤ Red < 1040
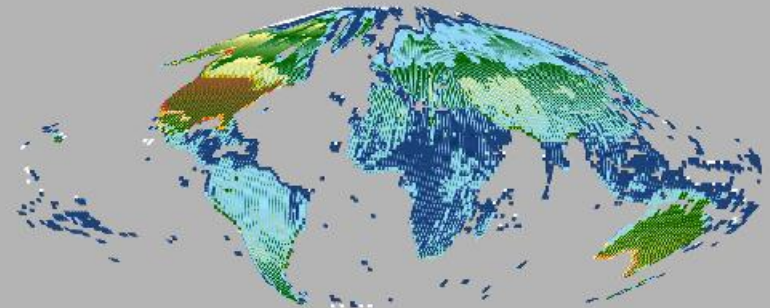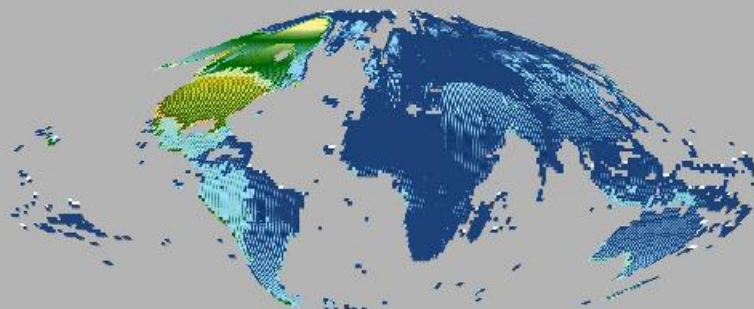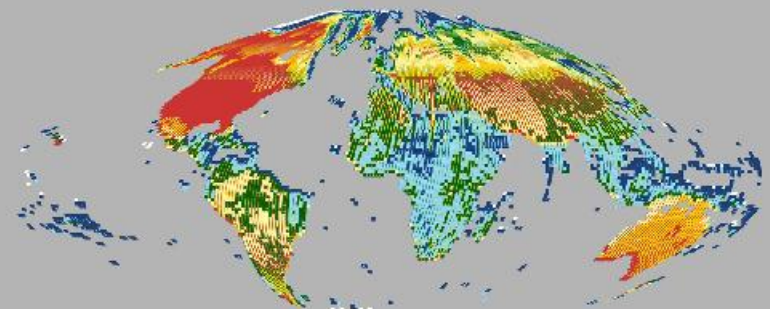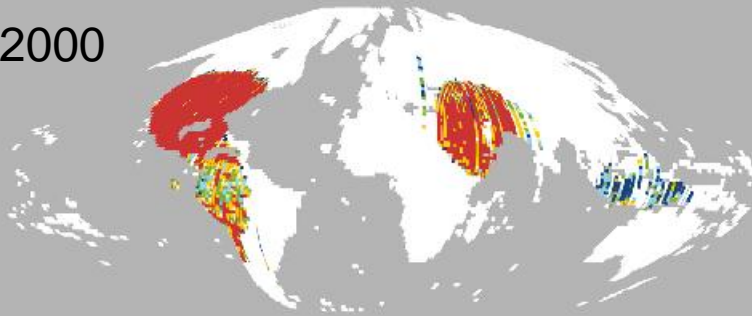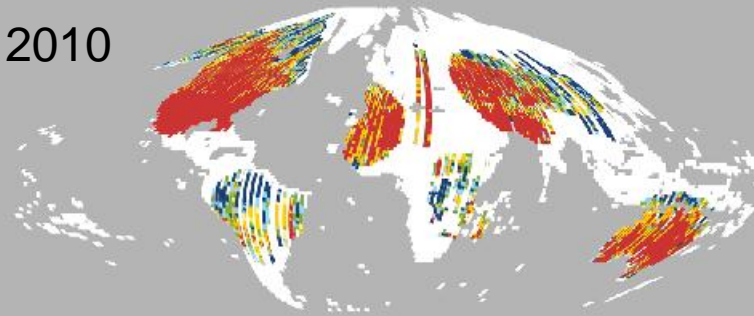
Probability of ≥1 cloud-free land observation occurring in each of 3 seasons with the highest seasonal probabilities of cloud-free land observation, 12 months

Probability of ≥1 cloud-free land observation occurring in each of 3 seasons with the highest seasonal probabilities of cloud-free land observation, 36 months

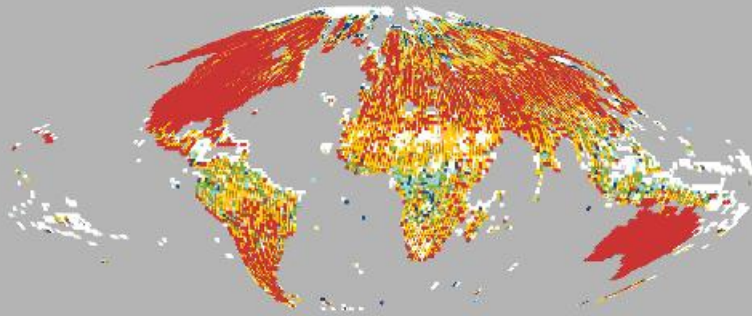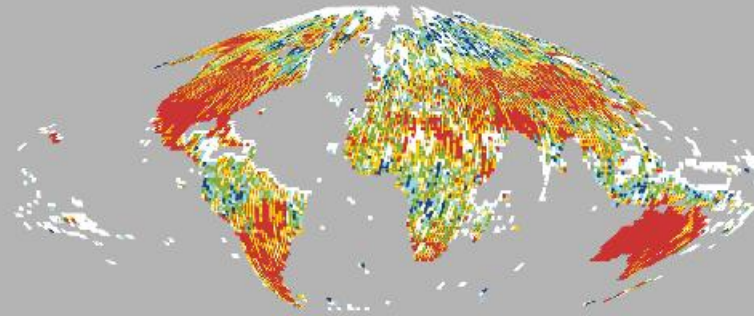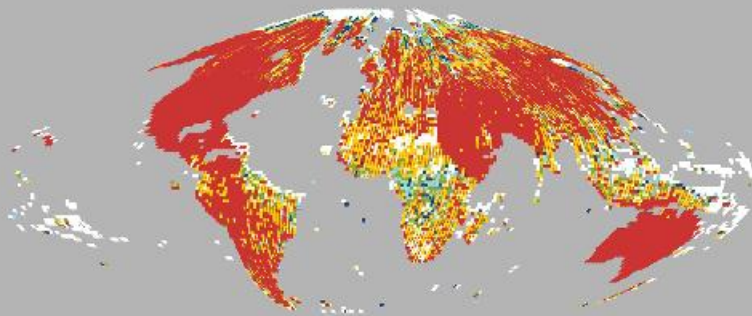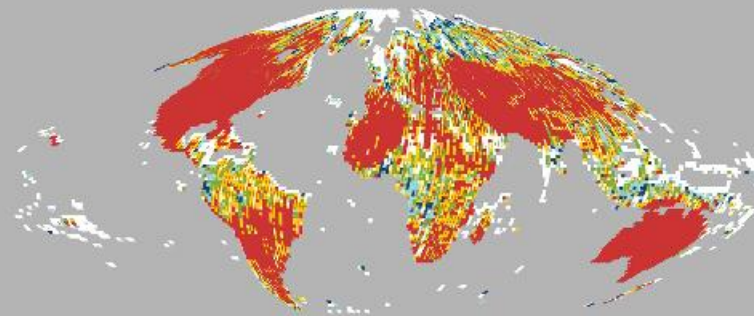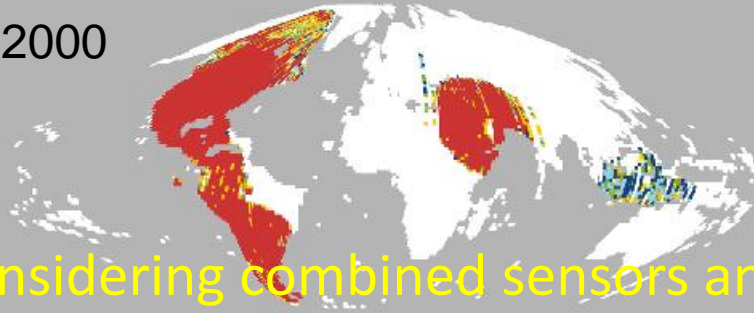Considering combined sensors and 36 months of data 86% (2000) and 84% (2010) of the global land have P ≥0.95

2000

2010

TM

TM

ETM+

ETM+

TM and ETM+

TM and ETM+

0.95 = < Red = < 1

Planned Global WELD Production on NEX
monthly 30m products, fusion of contemporaneous Landsat 4,5,7
6 epochs of 36 months

Number of Landsat scenes in U.S. archive

Process in reverse chronological order

First products (36 months 2010 epoch) planned to be available from USGS EROS late 2013
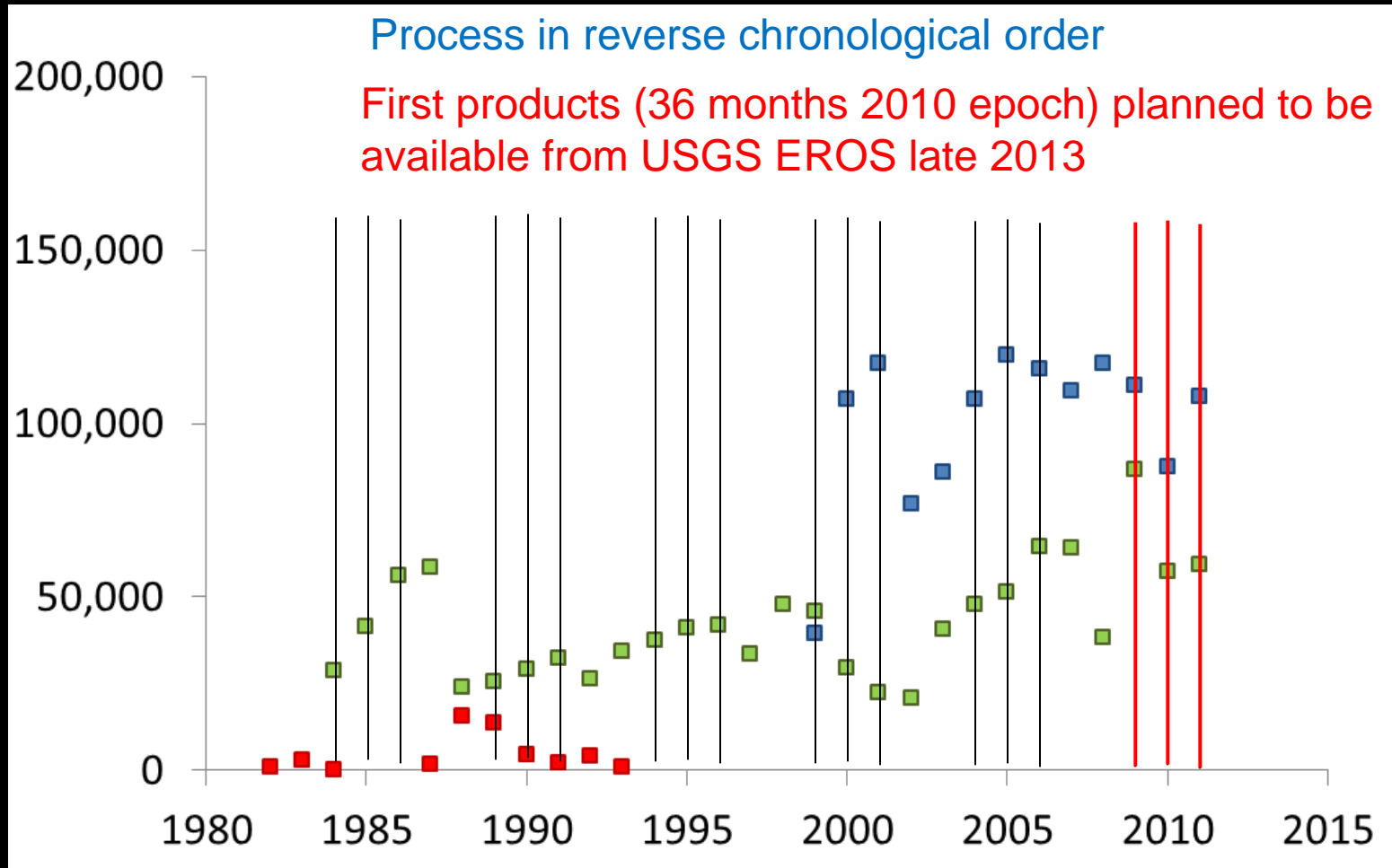
Landsat repatriation from other space agencies will provide more Landsat data in earlier epochs

Landsat Satellite Series
The longest Land surface observation record
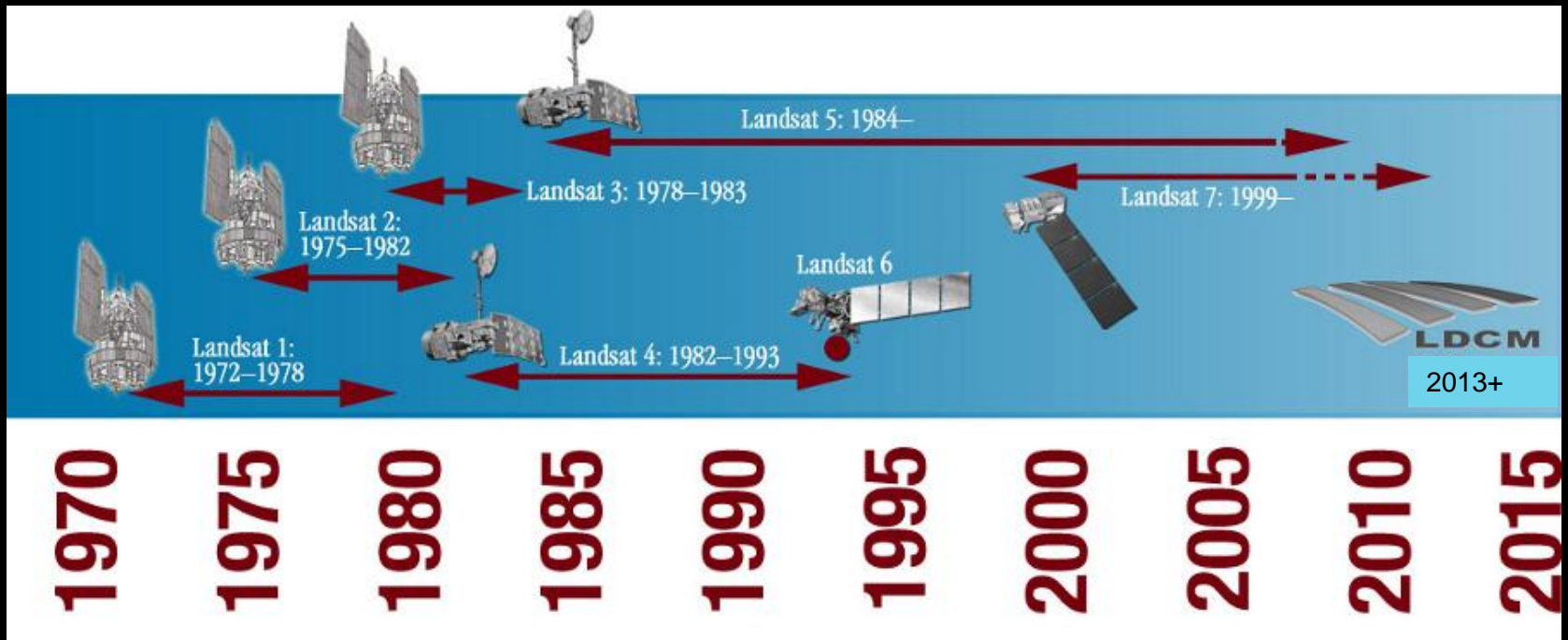
WELD process LDCM data
(CONUS)

4 WELD LDCM Tasks - Investigate

1. WELD product continuity into the LDCM era
   - generation of WELD LDCM products

2. WELD LDCM product performance
   - quality assessment
   - validation
   - characterization of the consistency of the WELD TM, ETM+, LDCM product time series

3. The utility of the WELD product record to develop "higher-level" derived products
   - collaboration with Sci. Team, NASA & USGS staff, academia

1. Expansion of the WELD internet product distribution interface to support WELD LDCM products

WELD LDCM Prototyping 14 WELD 5000 x 5000 30m pixel tiles (red), that encompass Ameriflux towers (green triangles) and AERONET sites (white squares)
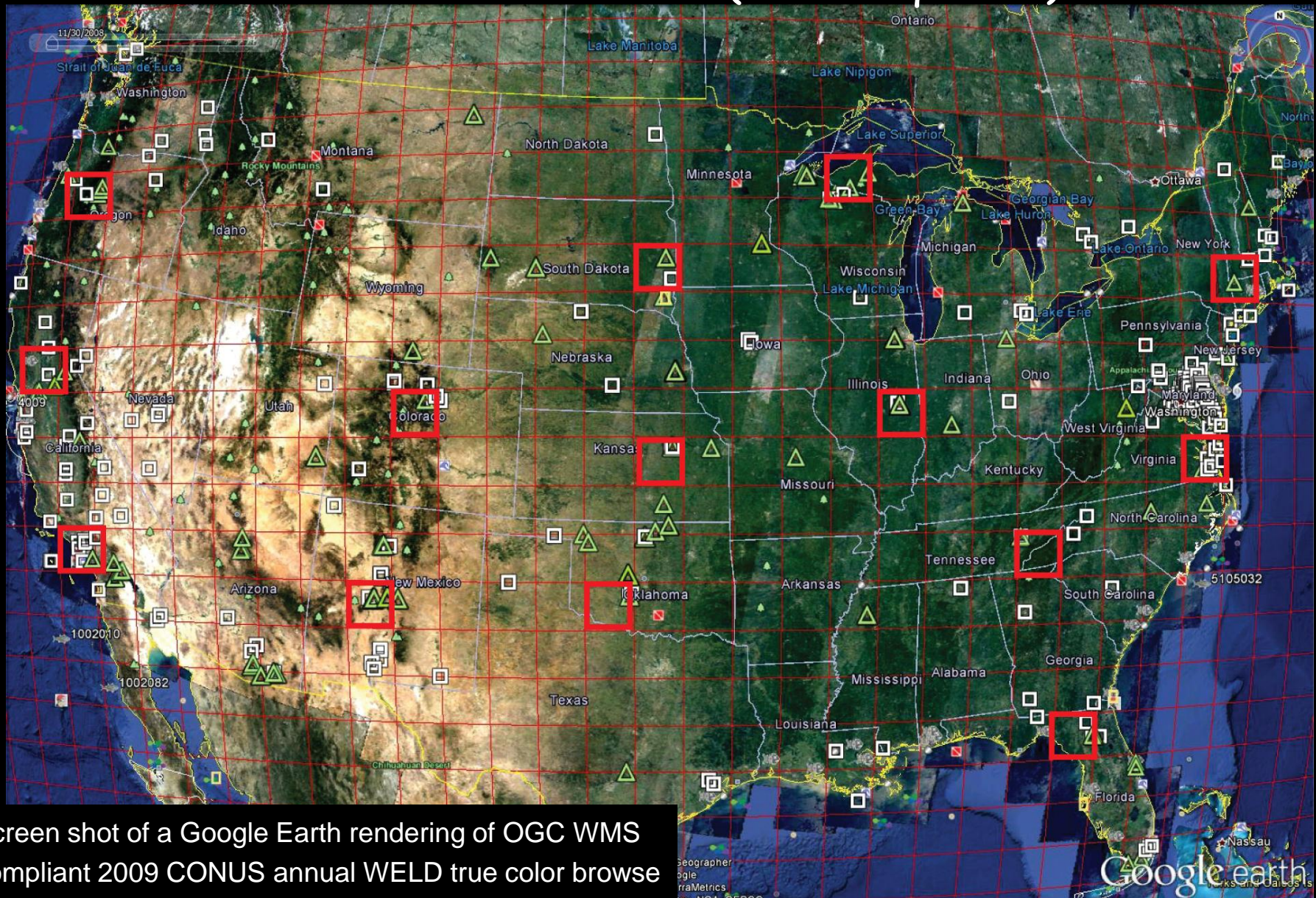
Screen shot of a Google Earth rendering of OGC WMS compliant 2009 CONUS annual WELD true color browse

WELD LDCM Schedule

- ## Year 1
  - – understand the LDCM L1T format
  - – secure the L1T data flow to SDSU GIScCE WELD computers
  - – QA of the first light LDCM L1T data
  - – WELD LDCM algorithms: reflectance and brightness temperature, band saturation, NDVI

- ## Year 2
  - – WELD LDCM algorithms: cloud masks, angular geometry computation, re-projection, resampling and tiling, compositing, radiometric/BRDF normalization
  - – WELD product QA
  - – make products available to the science team and affiliates for evaluation
  - – refine algorithms and products as needed

WELD LDCM Schedule

- **<u>Year 3</u>**
  - generate one year of CONUS WELD LDCM products
  - make products and browse imagery available
  - undertake QA and any needed refinements

- **<u>Year 4</u>**
  - validate products
  - characterize the Landsat TM, ETM+ LDCM WELD product time series
  - generate 4+ years of 14 tiles of WELD products available for assessment of their utility for development of "higher-level" products
  - develop WELD LDCM internet distribution interface

- **<u>Year 5</u>**
  - assess the capability for expansion globally/institutionalization